



# Analysis of Potential Hazards with Job Safety Analysis (JSA) Method on Cargo Loading Work on Cargo Ship Mv. Wujiang At Pt X

ramadan Saputra<sup>1</sup>, Atjo Wahyu<sup>1</sup>, Lalu Muhammad Saleh<sup>1</sup>, Yahya Thamrin<sup>1</sup>, M. Furqaan Naiem<sup>1</sup>, Aminuddin Syam<sup>2</sup>

<sup>1</sup>Department of Occupational Safety and Health, Faculty of Public Health, Hasanuddin University, Makassar, Indonesia

<sup>2</sup>Department of Health Policy Administration, Faculty of Public Health, Hasanuddin University, Makassar, Indonesia

## Abstract

PT. X is a company engaged in Marine Transportation Services and Ship Agency (Shipping Agency & Marine Service) which serves more than 30 domestic ships and overseas ships per month and has a combination of knowledge of the Shipping Industry and Marine Services with experienced workers. In the work of loading cargo to cargo ships, the PT X company uses the services of Loading and Unloading Services (PBM) using many machines and heavy equipment but is still carried out manually operated by Loading and Unloading Workers (TKBM), which in use can cause potential hazards that can cause work accidents such as injuries to the hands and feet, muscle spasms when pulling ropes, hands and feet punctured and pinched wire, hit by heavy equipment, falling from a height or can even cause death. Therefore, it is necessary to analyze the potential hazards to minimize work accidents when carrying out work activities, namely by using the Job Safety Analysis (JSA) method. The research design used in this research is sequential explanatory design where in the first stage uses quantitative methods and in the second step uses qualitative methods to confirm the results of research conducted in the first stage. From the results of the research on the cargo loading work process on the MV.Wujiang there are 7 work steps with different risk levels, acceptable risk level there are 2 work steps, priority 3 risk level there are 2 work steps, substantial risk level there are 2 work steps and priority level 1 there is 1 work step. Therefore, it is necessary to control the hierarchy of control and hazard intervention such as regular maintenance of tools with the 5 R principles, making personal buckets to transfer workers, making hazard reports before working.

**Keywords:** Potential hazards, Cargo ships, Job safety analysis (JSA).

Full length article \*Corresponding Author, e-mail: [ramadansaputra874@gmail.com](mailto:ramadansaputra874@gmail.com)

Doi # <https://doi.org/10.62877/89-IJCBS-24-25-19-89>

## 1. Introduction

There are potential hazards almost everywhere an activity is carried out, whether at home, on the road or in the workplace. If not managed properly, these potential hazards can lead to occupational fatigue, occupational diseases, injuries and even serious accidents. In the Occupational Safety and Health Act (UU) No. 1 (K3) of 1970 [1]. Work accidents in shipboard work activities are an unwanted and unexpected event, from hazardous work implementation activities to date still often occur. every hazardous work activity certainly has procedures that have been systematically designed, and can be said to be well planned[2].

In the work of loading cargo onto cargo ships, the company PT X uses the services of Loading and Unloading Services (PBM), in loading and unloading activities using many machines and heavy equipment but is still carried out manually operated by Loading and Unloading Workers (TKBM) who carry out these activities. OHS risks are a problem that needs to be addressed. From the data records of risk event reports for each location of the unloading and loading area at PT X, 14 risk events were obtained from a total of 36 workplace accidents in a period of 3 years [3].

According to the stevedoring labor cooperative in 2015, data on work accidents including fatal accidents or deaths that occurred to stevedoring workers from 2011 to 2014 were obtained as many as 64. The detailed results of the incidence

of TKBM work accidents are that in 2011 there were 13 workers (20.3%), in 2012 there were 19 workers (29.7%), in 2013 there were 22 workers (34.3%) and in 2014 there were 10 workers (15.7%). Some of the causes of accidents include not following procedures as much as 40%, not wearing personal protective equipment as much as 25%, working with moving or dangerous equipment as much as 11%, unsafe equipment or goods 11% and causes of worker negligence as much as 13% [4]. In the world of shipping is always an issue related to the risk of loss of life, property and environmental pollution. According to Andry & Yuliani, 2014 in this case the most dangerous condition for ships is during bad weather, several ways have been researched to deal with this, including static stability analysis (IMO, 2008) and by analyzing the possibility of capsizing ships in bad weather [5]. According to the Safety and Shipping Review in 2014, Indonesia ranked first in total losses with 296 cases related to loading and unloading work. Other data obtained from the Directorate of KPLP Directorate General of Sea Relations in 2011 recorded 178 cases of accidents and 343 casualties with the causes of accidents grouped into human factors, natural factors, and technical factors (Suwestian Dkk, 2015)[6].

According to the results of research conducted by Sanusi et al, 2017 that accidents that occur in loading and unloading activities get up and down results from year to year which are caused by 2 factors, namely: (1) Human actions that do not fulfill work safety (unsafe action); (2) Unsafe environmental conditions (unsafe condition) (Sanusi et al, 2017). Based on the results of work accident data obtained from the shipping logistics department from 2015 to 2020, the data on work accidents on Vessel or ships unloading and loading cargo is the highest compared to other work areas [7]. Bearing this in mind, to reduce or prevent the value or amount of risk of work accidents that exist in the loading work activities on the MV. Wujiang, the job safety analysis (JSA) method is used According to OSHA 3071 revised in 2002, JSA is a technique or method that focuses on work tasks as a way to identify hazards before an incident or work accident occurs, in this case it aims that during cargo loading activities problems related to hazards that occur to workers can be controlled and even eliminated, so that workers who carry out cargo loading on cargo ships can run smoothly and avoid danger [8]. According to Dustin Fandy and Kriswanto Widiawan, 2022 Hazard identification is carried out so that the hazards in the company can be identified. Hazard identification is carried out by means of inspections, information on data on work accidents, illnesses and absenteeism, reports from the K3 team, P2K3, supervisors and worker complaints, and can also be through questionnaires, risk assessment is described by its severity, while risk evaluation is to determine whether existing risks are acceptable or control must be carried out immediately to reduce the existing risk level. [9]. Based on the above background, the researcher is interested and intends to study the "Analysis Of Potential Hazards With Job Safety Analysis (JSA) Method On Cargo Loading Work On Cargo Ship Mv. Wujiang At Pt X".

## 2. Materials and methods

The type of research used is a mixed method that uses qualitative and quantitative approaches simultaneously, the research design used in this research is sequential explanatory design where in the first step uses quantitative methods and in the second step uses qualitative methods to confirm the Saputra et al., 2024

results of research conducted in the first stage. This research was conducted in April-May 2023. The research site was carried out on the MV cargo ship. Wujiang at PT X Tanjung Merpati, North Morowali. In this study, the sampling technique used total sampling, namely where the number of samples is the same as the population where the sample data used must meet the inclusion and exclusion criteria set by the researcher, The population of this study were all workers who worked in the MV ship area. Wujiang in the cargo picking process on the MV. Wujiang. As for the population in this study amounted to 42 people. the definition of operation in this study is Hazard Identification, Risk Assessment, Control Recommendations and risk intervention, research on Hazard Potential Analysis With Job Safety Analysis (Jsa) Methods On Cargo Loading Work On Cargo Ship Mv. Wujiang At Pt X by using semi-quantitative analysis, namely consequences, likelihood of exposure and risk level. The results of the research are presented in the form of tables and reports. This study has received approval from the Health Research Ethics Commission (KEPK) Faculty of Public Health, Hasanuddin University on September 21, 2023 with protocol number: 13923062213 and letter number: 536766/UN4.14.1/TP.01.02/2023.

## 3. Results and Discussions

Based on table no. 1, the results of observations carried out on the cargo loading work process on the MV. Wujiang at PT X using the Job Safety Analysis (JSA) sheet, there are several potential hazards in all steps of work on cargo loading on MV. Wujiang. All potential hazards are analyzed using semi-quantitative risk analysis based on AS/NZS 4360:2004, after which it provides recommendations for risk control and risk intervention [10]. Then after the risk has been analyzed using the Job Safety Analysis (JSA) sheet of the work steps on cargo loading on the MV. Wujiang which has 7 work steps, it is found that the work is included in the risk with priority 1 category as much as 1 priority 3 category as much as 2, substantial category as much as 2 and acceptable category as much as 2. Implementation of Job Safety Analysis (JSA) on cargo loading work on the MV. Wujiang will be discussed as follows:

### 3.1. Analysis of hazard identification and risk assessment of workers in cargo loading work on board MV. Wujiang

The results of identification using the Job Safety Analysis (JSA) implementation sheet for 42 respondents, described that there are sources of danger at each step of the work on cargo loading on the MV. Wujiang. This happens because the cargo loading work on the MV. Wujiang uses heavy equipment and lifting equipment to lift cargo to move from barge to ship, in the process of operation requires special skills for crane operators and dozer operators and special training for signal men so that the lifting and moving of cargo is in place and more effective and efficient. Equipment and machinery can provide considerable benefits to its users, according to Anizar (2012) in Rezkyana (2022), but can also cause losses because the machine can be damaged, burned, or explode at any time. A work accident is when a machine breaks down, catches fire, or explodes [11]. Accidents caused by work tools and workers' propensity for accidents, will cause significant losses to the company. Risk assessment is an integral part of Government Regulation No. 50/2012 on SMK3. However, not all organizations or companies have

conducted risk assessments of potential hazards in the workplace. This risk assessment is carried out to determine the level of danger in each step of the work on loading the MV. Wujiang. [12]. Risk assessment is carried out by taking into account the level of likelihood, exposure and consequences of frequent or non-occurrence of the risk posed. The risk level is characterized by 5 levels, consisting of Very High, Priority 1, Substantial, Priority 3 and Acceptable. The highest potential hazard can come from equipment or machinery and the use of personal protective equipment (PPE). In this case, it is a factor of unsafe worker behavior at work due to the negligence of a worker so that work accidents can occur. In the cargo loading work on the MV. Wujiang has 7 work steps where the results show that the risk that falls into the Priority 1 category is in work step 3, namely the transfer of workers from the ship to the barge, the risk that falls into the priority 3 category is 2 work steps, namely in the work step of leaning the barge to MV. Wujiang and filling cargo in buckets, risks that fall into the substantial category are 2 work steps, namely in the work steps of preparing loading equipment and lifting cargo buckets from barges to ships and risks that fall into the acceptable category, namely in the work steps of installing Wire on buckets on barges and removing Wire on buckets on Wujiang ships.

### **3.2. Analysis of Control Recommendations on Cargo Loading Work on the MV. Wujiang**

In the hierarchy of control, the first control recommendation is elimination, which is the first step in controlling and is the best solution in controlling potential hazards and risks, namely by eliminating a hazard that exists in the workplace. In this case, it is in accordance with Darmiatun & Tasrial (2015) which explains that the best way to control hazards is by eliminating these hazards. Elimination can be done by making changes to the work process so that hazardous tasks are no longer performed, or the physical hazard is eliminated. According to OHSAS 18001 Elimination can be enabled in various ways, such as replacing hazardous equipment or materials with safer ones, changing the design to eliminate hazards, or removing unnecessary processes [13]. The next hierarchy of control is substitution, The use of the substitution method aims to replacement of components, materials, work tools components, materials, work tools that are dangerous to be safer and better, which focuses on replacing the hazard with something safer and more convenient. Substitution hierarchy of control can be implemented in various ways, such as replacing hazardous equipment or materials with better and safer ones, replacing hazardous processes with better and safer ones, or replacing hazardous work methods with better and safer ones. Substitution control also replaces hazardous materials with less hazardous materials or reduces system energy. Because when doing cargo loading work on the MV cargo ship. Wujiang uses materials or equipment that have the potential to cause a source of danger or excessive energy system [14]. This is in accordance with Darmiatun & Tasrial (2015) which states that substitution is the second most effective way to control risk / danger. In this case, the recommendation for substitution control is in the work step of leaning the barge to the MV. Wujiang by replacing ropes that are no longer suitable for use or damaged, at the loading equipment preparation work step by replacing loading equipment such as wire, seals and fishing rods that are no

*Saputra et al., 2024*

longer suitable for use or damaged. The next hierarchy of control, namely Engineering Control, Engineering control and administrative control approaches can significantly reduce complaints (ergonomic risks) experienced by workers experienced by workers significantly, is one of the levels in the hierarchy of hazard control for Occupational Safety and Health (K3) which is carried out to reduce the risk of hazards in the workplace which aims to separate hazards from workers and to prevent human error or human error. This control is installed in a canceled system unit or machine. engineering control focuses on controlling risks by engineering a tool or material with the aim of controlling the danger. In this study, control recommendations by means of engineering control are carried out at the work step of transferring workers from ships to barges by making or procuring personal buckets to move workers from ships to barges and vice versa from barges to ships [15]. The next hierarchy of control is Administrative Control, This control aims to control the human side that will do the work. Administrative control can also be defined as administrative control, such as controlling safety signs, safety procedures, siren warnings, inspections, access control, equipment, work permits, safe systems, hazard marking, and so on. Administrative control is aimed at controlling the side of the workers who will do the work, by controlling work methods it is hoped that people will comply, have sufficient expertise and ability to complete the job safely. i.e. controlling hazards by modifying the interaction factors between workers and the work environment [16]. The last hierarchy of control is Personal Protective Equipment (PPE), Personal Protective Equipment (PPE) is a tool used by workers to protect their entire body against potential hazards of work accidents or occupational diseases in the work environment, PPE can be defined as a tool used to protect workers from injury or disease caused by interaction or contact with hazards in the workplace, both physical, chemical, biological, radiation, electrical, mechanical and others. In this study, control recommendations with the use of PPE are carried out at each step of cargo loading work on the MV. Wujiang [17].

### **3.3. Risk Intervention Analysis of Cargo Loading Work on the MV. Wujiang**

According to Isbandi Rukminto Adi, 2008 Intervention is a specific action by a social worker in relation to a human system or process in order to cause change [18] according to Wibowo, 2018 that social intervention is a planned change carried out by change agents towards various goals of change. Intervention in this study is a specific action in a particular relationship. Intervention is often a step taken to improve the situation by following up specifically on advice and risk control measures on potential hazards obtained. Risk interventions in this study are recommended by researchers and discussed with the company. [19]. There are several control interventions recommended at the cargo loading work step on the MV. Wujiang are described as follows

Control interventions carried out at the work step on cargo loading work on the MV. Wujiang, namely recommending to the unloading team by means of regular maintenance of equipment in the form of replacing damaged ropes, inspection, repair, cleaning, lubrication of equipment. This can prevent damage to equipment and ropes, can minimize repair costs and can extend the life of equipment and ropes and reduce damage that can occur at any time

during the work process, always uses the 5 R principle, namely in this case the maintenance of tools such as wire, buckets, seals and fishing rods on a regular basis in the form of replacing damaged equipment, separating damaged equipment, inspection, repair, cleaning, lubrication of equipment, make personal buckets to transfer workers both from barge to ship and from ship to barge, recommends the company to make a hazard report before doing work using the hazard report form, change from regular gloves to levis fabric and leather combination gloves, adding personal protective equipment in the form of safety goggles (safety glasses).

### **3.4. Distribution of Exposure Risk Analysis at the Work Stages of the Cargo Loading Process on MV. Wujiang at PT X.**

Based on the figure no 1, the distribution of respondents in answering questionnaire questions on risk analysis of exposure levels in cargo loading work on MV. Wujiang shows that the level of exposure based on hazards in work step 1, the majority of respondents answered in the rare category as many as 10 people (23.8%), work step 2, the majority of respondents answered in the frequent category as many as 12 people (28.6%), work step 3, the majority of respondents answered in the frequent category as many as 14 people (33.3%), work step 4 the majority of respondents answered with the category not often as many as 13 people (31.0%), work step 5 the majority of respondents answered with the category not often as many as 12 people (28.6%), work step 6 the majority of respondents answered with the category rarely as many as 10 people (23.8%), work step 7 the majority of respondents answered with the category rarely as many as 12 people (28.6%).

### **3.4 Distribution of Probability Risk Analysis at the Work Stages of the Cargo Loading Process on MV. Wujiang at PT X.**

Based on the figure no 2, the distribution of respondents in answering questionnaire questions on risk analysis of the probability level in cargo loading work on the MV. Wujiang shows that the level of probability based on hazards in work step 1 the majority of respondents answered in the category of rarely occurring as many as 15 people (35.7%), work step 2 the majority of respondents answered in the category of rarely occurring as many as 17 people (40.5%), work step 3 the majority of respondents answered in the category of likely to occur as many as 16 people (38.1%), work step 4 the majority of respondents answered with a small possibility category as many as 11 people (26.2%), work step 5 the majority of respondents answered with a small possibility category as many as 14 people (33.3%), work step 6 the majority of respondents answered with a rare category as many as 11 people (26.2%), work step 7 the majority of respondents answered with a rare category as many as 13 people (31.0%).

### **3.5 Distribution of Consequence Risk Analysis at the Work Stages of the Cargo Loading Process on the MV Ship. Wujiang at PT X**

Based on the figure no 3, the distribution of respondents in answering questionnaire questions on risk analysis at the

consequence level in cargo loading work on the MV. Wujiang shows that the level of probability based on hazards in work step 1 the majority of respondents answered in the very serious category as many as 10 people (23.8%), work step 2 the majority of respondents answered in the very serious and serious categories as many as 10 people (23.8%), work step 3 the majority of respondents answered in the disaster category as many as 18 people (42.9%), work step 4 the majority of respondents answered in the serious category as many as 13 people (31.0%), work step 5 the majority of respondents answered in the important category as many as 13 people (31.0%), work step 6 the majority of respondents answered in the important category as many as 11 people (26.2%), work step 7 the majority of respondents answered in the important category as many as 13 people (31.0%).

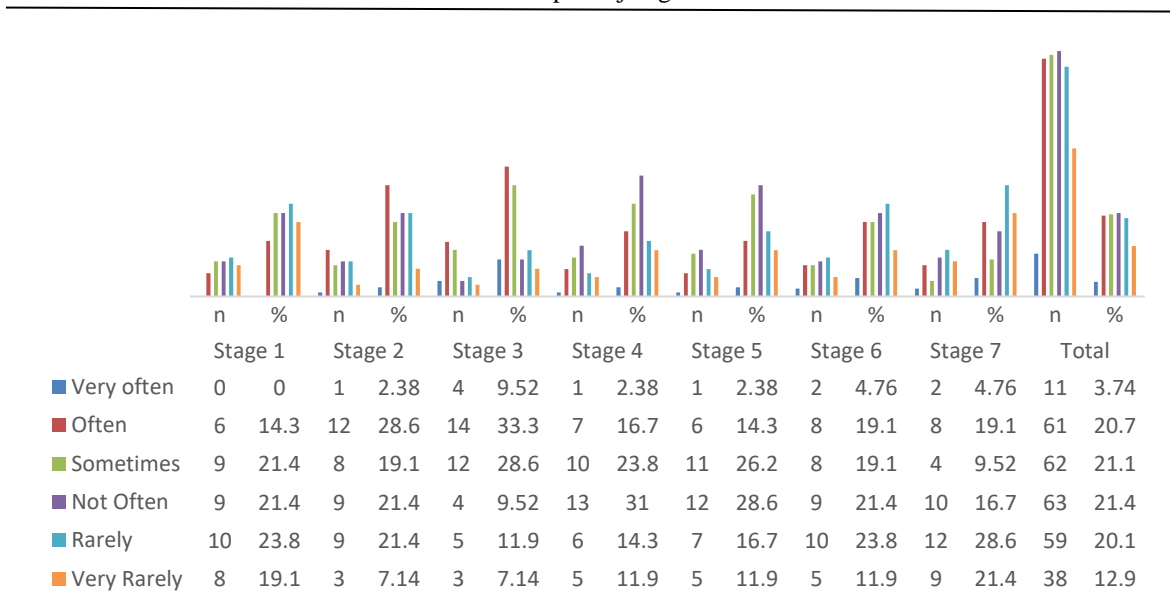
### **3.6 Characteristics of informants**

Informants are people who are used to provide information about the situation and conditions of the research setting [20]. Based on table no. 2, the description of the characteristics of informants in the study aims to provide information about the general state of work on cargo loading on the MV. Wujiang. Informants are parties who are used as samples in a study. The supporting data used in this study are primary data and secondary data. The data obtained based on the characteristics of the informants will show the characteristics contained in the rare steps of cargo loading work on the MV. Wujiang. The characteristics of informants are informants who are divided into 2 key informants, 2 main informants and 2 supporting informants. Based on the information from the informant above, it can be concluded that the preparation stage of cargo loading work on the MV. Wujiang which is carried out, namely checking the condition of equipment and labor and conducting breafing to convey tasks to each worker and also saftey talk before work, in the cargo loading process on the MV. Wujiang, namely buckets, wires, seals and fishing rods, as for the PPE required for workers, namely helmets, safety shoes, gloves and masks and before work is carried out, a check is carried out on equipment and PPE. in the process of cargo loading work on the MV cargo ship. Wujiang and how likely you are to experience risk because workers directly interact with equipment and heavy equipment as for the hazards that exist in cargo loading work on the MV. Wujiang, namely hands and feet exposed to fishing rods, punctured wire, dislocated feet and hands due to being wrapped around the barge rope, for how likely to experience the risk is very large some workers have experienced this risk, When doing work, it is quite good and there are two types of equipment used, namely new equipment and used equipment, for used equipment, even though it is used, it is still suitable for use and also before doing the work, check the equipment to be used, Based on the information from the informants above, it can be concluded that some workers have experienced work accidents and have also seen workers experiencing work accidents, In handling the risk of work accidents, the company must further improve and be serious in implementing OHS, must complete OHS equipment and also conduct OHS training for workers in order to create zero accidents at work.

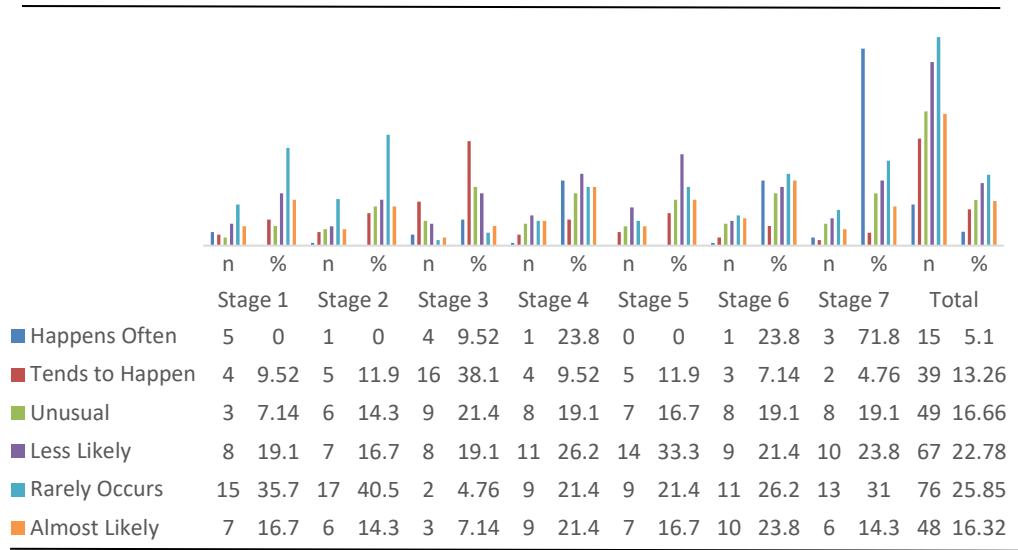
**Table 1:** The results of hazard identification in the cargo loading work of mv. Wujiang using the Job Safety Analysis (JSA) Worksheet

NO	Work steps	Risk	RISK ANALYSIS			RISK RATING
			E	P	C	
1	Anchoring the barge to MV. Wujiang	1. Entangled in the rope 2. Injuries to hands and feet 3. Exposed to muscle spasms while pulling the rope 4. Dislocated hands and feet while pulling the rope	Occasionally	Likely to Occur	Important	PRIORITY 3
2	Preparation of loading equipment	1. hands and feet exposed to fishing line and seals 2. pierced by wire	Occasionally	Likely to Occur	Important	SUBSTANSIAL
3	Transfer of workers from ship to barge	1. falling down 2. hand caught by the wire 3. foot hit by the fishing line	not often	Likely to Occur	very serious	PRIORITY 1
4	Cargo loading on bucket	1. hit by excavator 2. slipped on the cargo pile 3. foot and hand injuries	Occasionally	Likely to Occur	Important	PRIORITY 3
5	Wire installation on the bucket on the barge	1. hands and feet exposed to fishing line and seals 2. body hit by bucket 3. slipped on the cargo pile 4. hit by excavator	Occasionally	low probability	Important	Acceptable
6	Lifting of cargo bucket from barge to ship	1. hit by cargo debris 2. hit by bucket 3. eye hit by cargo debris	not often	likely to occur	serious	SUBSTANSIAL
7	Removal of Wire on bucket at ship	1. hands and feet exposed to fishing line and seals 2. body hit by bucket 3. slipped on the cargo pile	Occasionally	low probability	Important	Acceptable

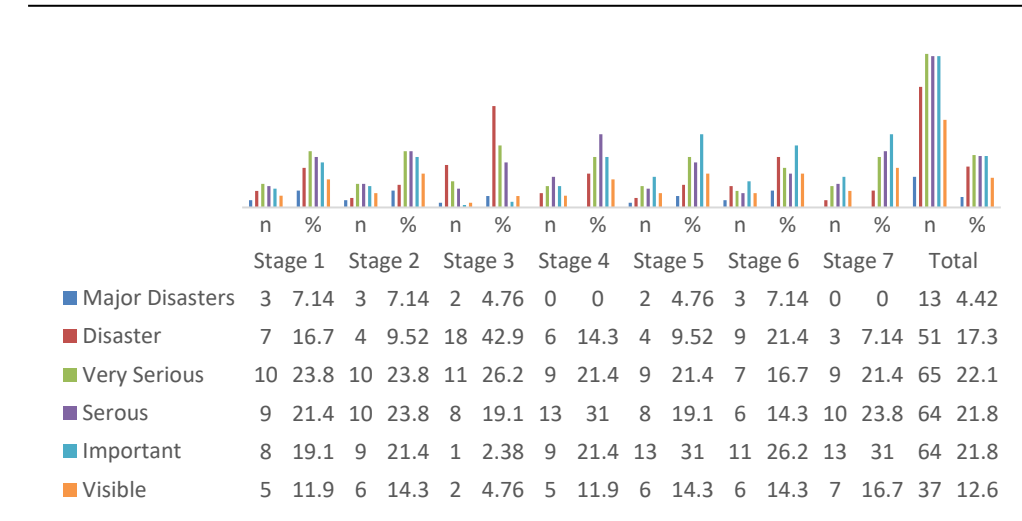
**Figure 1:** Distribution of Exposure Risk Analysis at Stages of Work Cargo Loading Process on MV Ship. Wujiang at PT X.



**Figure 2:** Distribution of Probability Risk Analysis at Stages of Work Cargo Loading Process on MV Ship. Wujiang at PT X



**Figure 3:** Distribusi Analisis Risiko Consequence Pada Tahapan Pekerjaan Proses Pemuatan Kargo Pada Kapal MV. Wujiang di PT X.



**Table 2:** Characteristics Of Informants

NO	INFORMANT'S INITIALS	GENDER	AGE	EDUCATION LEVEL	JOB
1	MAD	Male	30	HIGH SCHOOL	Supervisor
2	KA	Male	29	DEGREE 1	Loading Master
3	AFL	Male	29	HIGH SCHOOL	Foreman
4	SA	Male	28	HIGH SCHOOL	Foreman
5	DS	Male	27	HIGH SCHOOL	Tallyman
6	AG	Male	26	HIGH SCHOOL	Logistics Department

#### 4. Conclusions

In handling the risk of work accidents, the company must further improve and be serious in implementing OHS, must complete OHS equipment and also conduct OHS training for workers in order to create zero accidents at work.

Risk assessment of each work step in the cargo loading work process on the MV. Wujiang with different risk levels. There are 2 work steps that get an acceptable risk level, namely in the work step of installing the wire on the bucket on the barge and removing the wire on the bucket in the hatch, which means that the intensity that causes risk is reduced to a minimum. There are 2 work steps that get a priority 3 risk level, namely in the work step of leaning the barge to the MV. Wujiang and filling the cargo in the bucket which means that it needs to be supervised and paid attention to continuously. There are 2 worker steps that get a substantial risk level, namely in the work steps of preparing loading equipment and lifting cargo buckets from barges to ships, which means that technical improvements are required. There is 1 work step that gets a priority 1 risk level, namely in the work step of transferring workers from the ship to the barge, which means that it needs to be controlled as soon as possible.

Control recommendations given at the cargo loading work step on the MV. Wujiang based on the hierarchy of control, namely by way of substitution, engineering control, administrative control and personal protective equipment (PPE). Risk interventions proposed to the company are regular maintenance of tools with the 5 R principles, making personal buckets to transfer workers, making hazard reports before work, changing ordinary gloves to a combination of levis cloth and leather gloves, adding personal protective equipment in the form of safety goggles (safety glasses).

#### References

- [1] Depnaker No. 1. (1970). UU No.1/1970. Undang-Undang No. 1 Tahun 1970 Tentang Keselamatan Kerja, Hygiene Perusahaan Dan Kesehatan Kerja.
- [2] Tarwaka. (2008). Keselamatan dan Kesehatan Kerja, Manajemen dan Implementasi Kesehatan dan Keselamatan Kerja di Tempat Kerja. Surakarta: Harapan Press.
- [3] Setiawati. W. dkk. 2022. Analisis Proses Bongkar Muat Oil Product Pada Kapal Tanker (Studi Kasus Di MT Sharon Milik PT Gebari Medan Segara). Majalah Ilmiah Bahari Jogja (MIBJ) Vol. 20 (1), 2022 (62-73)
- [4] NaimA. (2022). Faktor-Faktor Yang Berhubungan Dengan Perilaku Pekerja Pada Tenaga Kerja Bongkar Muat (Tkbm) Di Pelabuhan Tanjung Emas Semarang Tahun 2020: Higeiajournal Of Public Health Research And Development. 4 (1)
- [5] Andry, M. A., & Yuliani, F. (2014). Implementasi Kebijakan Keselamatan Pelayaran. Jurnal Administrasi Pembangunan, 2(3), 259–264.
- [6] Setiawati. W. Dkk. 2022. Analisis Proses Bongkar Muat Oil Product Pada Kapal Tanker (Studi Kasus Di Mt Sharon Milik Pt Gebari Medan Segara). Majalah Ilmiah Bahari Jogja (Mibj) Vol. 20 (1), 2022 (62-73)
- [7] Sanusi, Despriadi, A, Yusdinata, Z. (2017). Analisa Potensi Bahaya dan Risiko Kegiatan Bongkar Muat di Pelabuhan PT Sarana Citranusa Kabil dengan Metode Hirarc. ISSN. 2 (1), 119-125.
- [8] OSHA 3071. (2002). OSHA 3071. Accident Prevention and Osha Compliance, 2002, 25–29. <https://doi.org/10.1201/9781315136578-6>
- [9] Dustin Fandy Dan Kriswanto Widiawan, 2022. Identifikasi Bahaya, Penilaian Risiko, Dan Pengendalian Risiko Kecelakaan Kerja Di PT AW Plus UPVC Bali, Jurnal Titra, Vol. 10, No. 2, Juli 2022, Pp. 129–136
- [10] AS/NZS 4360. 2004. Australian/New Zealand Standard Risk Management
- [11] Rezkyana, dkk (2024). Analysis Of Work Accident Risk In Plywood Productionunits Using Job Safety Analysis Method At Ptintracawood Manufacturing Tarakan City. Journal Of Law And Sustainable Development. 4 (1): 1-15.
- [12] Peraturan Pemerintah No.50 Tahun 2012 – Sistem Manajemen Keselamatan dan Kesehatan Kerja.
- [13] Darmiatun dan Tasrial (2015). Prinsip-Prinsip K3LH. Jakarta: Gunung Samudera.
- [14] T. Michael, W. Kriswanto. (2022). Hazard Identification, Risk Assessment and Risk Control (HIRARC) pada CV Lisa Jaya Mandiri Food: Jurnal Titra. 10 (2): 641-648.
- [15] N. C. Rizani, R. Bramandita, and W. Septiani. Penerapan Engineering Control Dan Administrative Control Sebagai Bentuk Intervensi Ergonomi Di Pt Ganding Toolsindo tahun 2012.J@ti Undip: Jurnal Teknik Industri. 6 (2): 105-110.
- [16] R. A. Nurfauzan, D. Thaib. (2018) Gambaran Tingkat Risiko Kesehatan Dan Keselamatan Kerja Pada Bagian Produksi I Di Pt. “X” Menggunakan Metode Hazard Identification, Risk Assessment And Risk Control (Hirarc) Tahun 2018. Enviromental Occupational Health And Safety Journal. 1 (1): 61-70
- [17] Aini, A., Putri, V., & Apriyanti, P. (2023). Edukasi Pemakaian APD (Alat Pelindung Diri) pada Pekerja. Jurnal Peduli Masyarakat, 5(1): 221-226.
- [18] Adi, Isbandi Rukminto. 2008. Intervensi Komunitas: Pengembangan Masyarakat sebagai Upaya Pemberdayaan Masyarakat. Jakarta: Rajawali Pers.
- [19] T. S. Wibowo. (2018). Intervensi Untuk Meningkatkan Motivasi Belajar Anak Asuh Di Psa Yogyakarta Unit Budhi Bhakti Wonosari Gunung Kidul tahun 2018: Jurnal Ilmu Kesejahteraan Sosial. 7 (2): 108-132
- [20] Khosiah, Hajrah, Syafril (2022). Persepsi Masyarakat Terhadap Rencana Pemerintah Membuka Area Pertambangan Emas di Desa Sumi Kecamatan Lambu Kabupaten Bima. Jurnal Ilmu Sosial dan Pendidikan. 1 (2): 141-149.